RGPV (DIPLOMA WING) BHOPAL	OBE CURRICULUM FOR THE COURSE	FORMAT-3	Sheet No. 1/3

Branch	Refrigeration And Air Conditioning	Semester	V

Course Code	503	Course Name	System Control And Instrumentation

Course Outcome 1	Describe the Temperature measuring instruments and its control used in RAC systems	Teach Hrs	Marks
Learning Outcome 1	Define Various temperature measuring device used in refrigeration and air conditioning systems	5	10
Contents	Introduction of temperature measuring device, Classification of temperature measurement. Types of Thermometers.		
Method of Assessment	Paper pen test		
Learning Outcome 2	Explain the working of various thermometers.	10	10
Contents	Liquid filled thermometer, gas thermometer, vapor pressure thermometer, bimetallic thermometer, portable thermometer and thermometer temperature probe. Probes. Noncontact device		
Method of Assessment	Theory exam		
Learning Outcome 3	Explain the working of various Thermocouple, and thermostat.	10	10
Contents	Purpose Various types of Thermocouple, temperature indicating and recording instruments use with thermocouple, radiation and optical pyrometer, thermostat, two position thermostat, electronic thermostat, pneumatic thermostate.		
Method of Assessment	Theory exam		
Course Outcome 2	Describe Pressure measuring instrument and its control.	Teach Hrs	Marks
Learning Outcome 4	Explain the working of manometer and different pressure gauge used in used in RAC systems	8	10
Contents	Introduction of manometer, types and its use, well type pressure gauge, bellows in pressure gauge, burden tube pressure gauge, differential pressure gauge, and diaphragm type differential pressure devices.		
Method of assessment	Paper pen test		
Learning Outcome 5	Explain principle construction and working of different transducers.	8	10
Content	Transducer-introduction, characteristics and classification of transducer, construction and working of resistance, inductance, capacitance and piezoelectric transducers.		
Method of assessment	Theory exam		
Course Outcome 3	Describe refrigeration system balancing and controls.	Teach Hrs	Marks
Learning Outcome 6	Define various types of pressure and temperature regulating valve.	10	10

Contents	Evaporator pressure regulator, suction pressure regulator, temperature regulating valve, solenoid valve, check valve, pressure relief valve.		
Method of Assessment	Theory exam		
Learning Outcome 7	Explain about the various refrigeration accessories and its control.	10	10
Contents	Refrigerant pumps, cooling tower fans, compressor motor protection devices, oil equalizing in multiple evaporators, different defrosting and capacity control method and their implications-Testing of air conditioners, refrigerators, visi coolers, cold rooms, calorimetric tests.		
Method of Assessment	Theory exam		
Learning Outcome 8	Explain remote and computerized controlling in Modern RAC Systems	10	30
Contents	Remote controller kit for air conditioners, computerized remote controlling of multipoint air conditioning zones.VRF Controllers , control panels, VAV Terminals functions of damper and actuator in VRF System. Building management system		
Method of Assessment	Laboratory Test by observation(part of practical exam)		
Course Outcome 4	Describe electrical switches and relays and other controlling equipments in RAC systems	Teach Hrs	Marks
Learning Outcome 9	Explain relays and different types of motor and valve.	5	10
Contents	Relays, Hot wire current coil etc., electrical damper motors, pneumatic motors, modulating motors, control motors, two position damper motors,-control valves solenoid types, diaphragm and motorized valves, three way valves.		
Method of Assessment	Theory exam		
Learning Outcome 10	Explain overload protection and other equipments	5	10
Contents	potential thermal overload protection for hermetic motors. Oil separation-discharge mufflers, accumulators, filters, driers, strainers, sight glass.		
Method of Assessment	Assignment/quiz		
Course Outcome 5	Describe sound and vibration control for RAC systems	Teach Hrs	Marks
Learning Outcome 11	Classify sound, its intensity and characteristic.	10	10
Contents	Sound, sound power and sound power level, intensity and characteristic, loudness, loudness level of noise, noise level, sound control for outdoor and indoor refrigeration and air conditioning system.		
Method of Assessment	Laboratory Test by observation(part of LW)		
Learning Outcome 12	Explain vibration and isolation of refrigeration and air conditioning system.	9	10
Contents	Vibration, vibration isolation, sound and vibration measurement, air flow noise in ducts, isolation of duct vibration, isolation of vibration and noise in pipes,.		
Method of Assessment	Laboratory Test by observation(part of LW)		

Learning Outcome 13	Explain the various types of vibration isolator materials used in refrigeration and air conditioning ducts.	5	10
Contents	Types of vibration isolator materials like a natural rubber, vibration isolation, steel spring, static deflection, coil spring.		
Method of Assessment	Theory exam		

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		R	0	1	5	0	3	1	1	

COURSE NAME	**SYSTEM CONTROL AND INSTRUMENTATION**
CO Description	CO-1 : Describe the Temperature measuring instruments and its control used in RAC systems
LO Description	LO-1 : Define Various temperature measuring device used in refrigeration and air conditioning systems

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Introduction of temperature measuring device, Classification of temperature measurement. Types of Thermometers.	Interactive Classroom method, Handout, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct Quiz/visit to make students practice their knowledge	5		Handouts, Charts, Videos	NIL

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Paper pen test	Student will be asked to the temperature measuring device used in refrigeration and air conditioning	10	Test paper+Rating scale	**Internal**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		R	0	1	5	0	3	1	2	

COURSE NAME	**SYSTEM CONTROL AND INSTRUMENTATION**
CO Description	CO-1 Describe the Temperature measuring instruments and its control used in RAC systems
LO Description	LO-2 Explain the working of various thermometers.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Liquid filled thermometer, gas thermometer, vapor pressure thermometer, bimetallic thermometer, portable thermometer and thermometer temperature probe. Probes. Noncontact device	Interactive Classroom method, Handout, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct Quiz/visit to make students practice their knowledge	10		Handouts, Charts, Videos, Models of renewable power generation	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Theory exam	Student will be asked to working of thermometers.	10	Question paper+Rating scale	**External**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		R	0	1	5	0	3	1	3	

COURSE NAME	**SYSTEM CONTROL AND INSTRUMENTATION**
CO Description	CO-1 Describe the Temperature measuring instruments and its control used in RAC systems
LO Description	LO-3 Explain the working of various Thermocouple, and thermostat.

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Purpose Various types of Thermocouple, temperature indicating and recording instruments use with thermocouple, radiation and optical pyrometer, thermostat, two position thermostat, electronic thermostat, pneumatic thermostat .	Interactive Classroom method, Handout, PPTs, Charts and Videos, Working Models of power utilization	Teacher will explain the contents and provide handout to students. Teacher will conduct Quiz/visit to make students practice their knowledge	10		Handouts, Charts, Videos, Working Models	NIL

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Theory exam	Student will be asked to Application of various types of Thermocouple, and thermostat	10	Question paper+Rating scale	**External**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		R	0	1	5	0	3	2	4	

COURSE NAME	**SYSTEM CONTROL AND INSTRUMENTATION**
CO Description	CO -2 Describe Pressure measuring instrument and its control
LO Description	LO-4 Explain the working of manometer and different pressure gauge used in used in RAC systems

SCHEME OF STUDY

S.No	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
1	Introduction of manometer, types and its use, well type pressure gauge, bellows in pressure gauge, burden tube pressure gauge, differential pressure gauge, and diaphragm type differential pressure devices.	Interactive Classroom method, Handout, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct Quiz/visit to make students practice their knowledge	8		Handouts, Charts, Videos	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Paper pen test	Student will be asked Explain the working of manometer and different manometer, pressure gauge	10	Test paper +Rating scale	**Internal**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		R	0	1	5	0	3	2	5	

COURSE NAME	**SYSTEM CONTROL AND INSTRUMENTATION**
CO Description	CO -2 Describe Pressure measuring instrument and its control.
LO Description	LO-5 Explain principle construction and working of different transducers

SCHEME OF STUDY

S. No	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Transducer-introduction, characteristics and classification of transducer, construction and working of resistance, inductance, capacitance and piezoelectric transducers. .	Interactive Classroom method, Handout, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct Quiz/visit to make students practice their knowledge	8		Handouts, Charts, Videos	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Theory exam	Student will be asked to classification, principle construction and working of different transducers.	10	Question paper+Rating scale	**External**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		R	0	1	5	0	3	3	6	

COURSE NAME	**SYSTEM CONTROL AND INSTRUMENTATION**
CO Description	CO-3 Describe refrigeration system balancing and controls.
LO Description	LO-6 Define various types of pressure and temperature regulating valve.

OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
1	Evaporator pressure regulator, suction pressure regulator, temperature regulating valve, solenoid valve, check valve, pressure relief valve.	Interactive Classroom method, Handout, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct Quiz/visit to make students practice their knowledge	10		Handouts, Charts, Videos	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Theory exam	Student will be asked to Define various types of pressure and temperature regulating valve.	10	Question paper +Rating scale	**External**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No.
		R	0	2	5	0	3	3	7	4

COURSE NAME	**SYSTEM CONTROL AND INSTRUMENTATION**
CO Description	CO-3 Describe refrigeration system balancing and controls
LO Description	LO-7 Explain about the various refrigeration accessories and its control.

SCHEME OF STUDY

S. No	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Refrigerant pumps, cooling tower fans, compressor motor protection devices, oil equalizing in multiple evaporators, different defrosting and capacity control method and their implications-Testing of air conditioners, refrigerators, visi coolers, cold rooms, calorimetric tests.	Interactive Classroom method, Handout, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct Quiz/visit to make students practice their knowledge	10		Handouts, Charts, Videos	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Theory exam	Student will be asked to define Refrigerant pumps, cooling tower fans, compressor motor protection devices, oil equalizing in multiple evaporators,	10	Question paper +Rating scale	**External**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		R	0	1	5	0	3	3	8	

COURSE NAME	**SYSTEM CONTROL AND INSTRUMENTATION**
CO Description	CO-3 Describe refrigeration system balancing and controls.
LO Description	LO-8 (IOT) Explain remote and computerized controlling in Modern RAC Systems

SCHEME OF STUDY

S. No.	Learning Content	T-L Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Remote controller kit for air conditioners, computerized remote controlling of multipoint air conditioning zones.VRF Controllers , control panels, VAV Terminals functions of damper and actuator in VRF System. Building management system	Interactive Classroom method, Handout PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct Quiz/visit to make students practice their knowledge		10	Handouts, Charts, Videos, Experimental setup for dryness fraction	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Laboratory Test by observation	Student will be asked to Explain Remote controller, computerized remote controlling of multipoint air conditioning zones.VRF Controllers , control panels, VAV Terminals damper and actuator. Building management system	30	Observation schedule/check list/rubric/rating scale	**External**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		R	0	1	5	0	3	4	9	

COURSE NAME	**SYSTEM CONTROL AND INSTRUMENTATION**
CO Description	CO-4 Describe electrical controlling equipments in RAC systems
LO Description	LO-9 Explain relays and different types of motor and valve.

SCHEME OF STUDY

S. No.	Learning Content	T-L Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Relays, Hot wire current coil etc., electrical damper motors, pneumatic motors, modulating motors, control motors, two position damper motors,-control valves solenoid types, diaphragm and motorized valves, three way valves.	Interactive Classroom method, Handout, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Experimental determination of entropy	5		Handouts, Charts, Videos, Experimental setup for	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Theory exam	Student will be asked to explain the Relays, electrical different types of damper motors, control valves solenoid types, diaphragm and motorized valves, three way valves.	10	Question paper +Rating scale	**External**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		R	0	1	5	0	3	4	10	

COURSE NAME	**SYSTEM CONTROL AND INSTRUMENTATION**
CO Description	CO-4 Describe electrical switches and relays and other controlling equipments in RAC systems
LO Description	LO-10 Explain overload protection and other equipments

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. / Tut Hrs.	LRs Required	Remark
	potential thermal overload protection for hermetic motors. Oil separation-discharge mufflers, accumulators, filters, driers, strainers, sight glass.	Interactive Classroom method, Handout, PPTs, Charts and Videos. Models of boilers, mountings and accessories	Teacher will explain the contents and provide handout to students. Teacher will conduct Quiz/visit to make students practice their knowledge	5		Handouts, Charts, Videos, Experimental setup for dryness fraction	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Assignment/Quiz	Student will be asked to Explain Hot wire current coil and potential thermal overload protection for hermetic motors. Oil separation-discharge mufflers, accumulators, filters, driers, strainers, sight glass.	10	Observation schedule/check list/rubric/rating scale	**Internal**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No.
		R	0	1	5	0	3	5	11	4

COURSE NAME	**SYSTEM CONTROL AND INSTRUMENTATION**
CO Description	CO-5 Describe sound and vibration control for RAC systems
LO Description	LO-11 Classify sound, its intensity and characteristic.

SCHEME OF STUDY

S. No.	Learning Content	T-L Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Sound, sound power and sound power level, intensity and characteristic, loudness, loudness level of noise, noise level, sound control for outdoor and indoor refrigeration and air conditioning system.	Interactive Classroom method, Handout PPTs, Charts and Videos, Models	Teacher will explain the contents and provide handout to students. Experimental determination of dryness fraction		10	Handouts, Charts, Videos, Experimental setup for dryness fraction	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Laboratory Test by observation	Student will be asked to explain Sound, sound power and sound power level, sound control for outdoor and indoor refrigeration and air conditioning.	10	Observation schedule/check list/rubric/rating scale	**Internal**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		R	0	1	5	0	3	5	12	
COURSE NAME	**SYSTEM CONTROL AND INSTRUMENTATION**									
CO Description	CO-5 Describe sound and vibration control for RAC systems									
LO Description	LO-12 Explain vibration and isolation of refrigeration and air conditioning system.									

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Vibration, vibration isolation, sound and vibration measurement, air flow noise in ducts, isolation of duct vibration, isolation of vibration and noise in pipes,.	Interactive Classroom method, Handout, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct Quiz/visit to make students practice their knowledge		9	Handouts, Charts, Videos, models	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Laboratory Test by observation	Student will be asked to explain Vibration, isolation, sound and vibration measurement, air flow noise in ducts, isolation of duct vibration, isolation of vibration and noise in pipes,	10	Observation schedule/check list/rubric/rating scale	**Internal**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		R	0	1	5	0	3	5	3	
COURSE NAME	**SYSTEM CONTROL AND INSTRUMENTATION**									
CO Description	CO-5 Describe sound and vibration control for refrigeration and air conditioning system..									
LO Description	LO-13 Explain the various types of vibration isolator materials used in refrigeration and air conditioning ducts.									

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Types of vibration isolator materials like a natural rubber, vibration isolation, steel spring, static deflection, coil spring.	Interactive Classroom method, Handout, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct Quiz/visit to make students practice their knowledge	5		Handouts, Charts, Videos, models	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Theory exam	Student will be asked to Types of vibration isolator materials like a natural rubber, vibration isolation, steel spring, static deflection, coil spring.,	10	Question paper+Rating scale	**External**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)